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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/023,745
Filing Date: December 21, 2001
Appellant(s): KIM ET AL.

David C. Oren
<u>For Appellant</u>

EXAMINER'S ANSWER

This is in response to the appeal brief filed 23 May 2006 appealing from the Office action mailed 24 August 2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is substantially correct.

The amendment after final rejection filed on 21 April 2006 has been entered.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct. The changes are as follows:

Appellant has stated that "claims 1-2, 6-8, and 10-42 stand rejected" over Russell et al. However, claims 20, 22-25, 27, and 39 are no longer pending. Therefore, claims 1, 2, 6-8, 10-19, 21, 26, 28-38, and 40-42 stand rejected under 35 U.S.C 102(b) over U.S. Patent 5,728,879 A to Russell et al.

(7) Claims Appendix

The copy of the appealed claims contained in Appendix A to the brief is correct.

(8) Evidence Relied Upon

US 5,627,879 A	Russell et al.	06-1997
US 5,067,173 A	Gordon et al.	11-1991

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1, 2, 6-8, and 10-19, 21, 26, 28-38, and 40-42 are rejected under 35 U.S.C. 102(b) as being anticipated by Russell et al. (US 5,627,879 A).

Regarding claim 1, Russell et al. disclose a communications system (Figures 17, 27A, 27B, 28, and 29), comprising:

a base station (comprising base station 330 shown in Figure 17 and parts of a "Head End" element which includes head end unit 332 and modulator/demodulator element 338 as shown in detail in Figures 27B and 28 respectively) configured to output first digital in phase and quadrature phase (I/Q) signals.

Specifically, Russell et al. disclose outputting first digital in phase and quadrature phase (I/Q) signals from the QAM modulator 460 which is located within AM modulator/demodulator 338 (see Figures 17 and 28 and column 17; lines 31-36). Examiner also notes that Russell et al. disclose that the element they call "base station 330" may be co-located with the head end unit 332, without being separated by lines 331A and 331B as illustrated in Figure 17 (see column 15, lines 35-42).

Further regarding claim 1, Russell et al. further disclose an optical connecting unit (comprising AM optical transmitter 462 which is also located within AM modulator/demodulator 338 as shown in Figure 28) configured to convert the first digital I/Q signals into optical signals and output the converted optical signals through an optical cable 340A (column 17, lines 35-36); and

an optical base station (comprising optical node 342 in Figure 17, which is shown in detail in Figure 29) coupled to receive the optical signal through the optical cable 340A and configured to convert the optical signals into second digital I/Q signals (using AM optical receiver 500 in Figure 29; column 17, lines 43-45), and convert the second digital I/Q signals into first RF signals for transmission (using QAM demodulator 502 and digital-to-analog converter 504 in Figure 29; column 17, lines 45-53).

Examiner notes that although Russell et al. do not specifically use the term "I/Q signals" in their disclosure, it is well understood in the communications art that quadrature amplitude modulated (QAM) signals *are* digital in phase and quadrature phase signals due to the nature of the modulation which defines QAM signals. Therefore, Russell et al. inherently disclose "digital I/Q signals" because they disclose QAM signals.

Regarding claim 2, Russell et al. disclose that the optical base station (again, optical node 342 in Figure 17, which is shown in detail in Figure 29) comprises:

an optical transceiver (including AM optical receiver 500; column 17, lines 43-45) configured to convert the optical signals received through the optical cable into the second digital I/Q signals;

a multiplexer/demultiplexer unit (QAM demodulator 502; column 17, lines 45-48) configured to demultiplex the second digital I/Q signals outputted from the optical transceiver;

an up-converter (mixer 506; column 17, lines 48-51) configured to convert and filter an output signal of the multiplexer/demultiplexer unit and output the first RF signals;

a high power amplifier 510 configured to amplify the first RF signals outputted by the up-converter; and

a duplexer 514 configured to filter the amplified first RF signals and provide the filtered output to an antenna 516 (column 17, lines 51-53).

Note that although QAM demodulator 502 is called a "demodulator," Russell et al. disclose in column 17, lines 45-48 that "QAM demodulator 502 receives an output from AM optical receiver 500 and *demultiplexes* and demodulates the signal" (emphasis added).

Regarding claim 6, Russell et al. disclose that the antenna elements in the optical base station (Figure 29) includes an additional antenna 520 for providing diversity reception with the main antenna 516 (column 17, lines 57-62). It would also be well understood in the art that main antenna 516 is also a "diversity antenna" (i.e., an antenna which enables diversity reception since it receives part of the signal along with the other antenna 520).

Regarding claim 7, Russell et al. disclose that the optical connecting unit (Figure 28) comprises:

a multiplexer/demultiplexer (QAM modulator 460; column 17, lines 33-36) configured to multiplex the first digital I/Q signals;

optical transceiver (including AM optical transmitter 462) configured to convert output signals of the multiplexer/demultiplexer into the optical signals and transmit the optical signals through the optical cable 340A to the optical base station; and

a clock unit configured to provide a synchronous signal to the multiplexer/demultiplexer unit (not explicitly shown, but disclosed in column 31, lines 3-9).

Regarding claim 8, Russell et al. discloses that the optical transceiver (including AM optical receiver 466 in Figure 28) is further configured to receive optical signals from the optical base station and convert the received optical signals into third digital I/Q signals to be transmitted to the base station (column 17, lines 36-41).

Regarding claim 10, Russell et al. disclose that the optical base station and the optical connecting unit are digital interface-based devices (column 16, lines 65-67; column 1, lines 1-2).

Regarding claim 11, as similarly discussed above with regard to claim 1, Russell et al. disclose a signal transmitting method for a communications system (Figures 17, 27A, 27B, 28, and 29), comprising:

converting first digital I/Q signals outputted from a base station into optical signals (using AM optical transmitter 462 in element 338 in Figure 28; column 17, lines 35-36);

transmitting the optical signals through an optical cable 340 A to an optical base station (optical node 342 in Figure 29);

converting the optical signals received through the optical cable into second digital I/Q signals (using AM optical receiver 500 in optical node 342; column 17, lines 43-45);

converting the second digital I/Q signals into RF signals (using QAM demodulator 502 and digital-analog converter 504 in optical node 342; column 17, lines 45-53); and

transmitting the RF signals through an antenna 516 (column 17, lines 51-53).

Regarding claim 12, Russell et al. disclose that converting the second digital I/Q signals to RF signals comprises:

demultiplexing the second digital I/Q signals (using QAM demodulator 502 in Figure 29); column 17, lines 45-48);

converting the demultiplexed signals to analog signals (using digital-to-analog converter 504);

band pass filtering the analog signals to generate the RF signals (using mixer 506; column 17, lines 48-51);

high-power amplifying the RF signals (using amplifier 510); and

filtering the amplified RF signals (using filter 512; column 17, lines 51-53).

Regarding claim 14, Russell et al. disclose that converting the first digital I/Q signals to the optical signals comprises multiplexing the first digital I/Q signals (using QAM modulator 460 in Figure 28; column 17, lines 33-36).

Regarding claims 13 and 15, Russell et al. disclose that demultiplexing and multiplexing is performed in accordance with a synchronous signal (column 31, lines 43-60). Specifically, Russell et al. disclose alternative embodiments of their communications network such as shown in Figure 42 including a plurality of base station units 906 which are optically connected to a plurality of remote optical base stations 902 over fiber links 905 (column 28, lines 50-67; column 29, lines 1-23), wherein demultiplexing and multiplexing of signals is performed in accordance with a synchronous signal (i.e., they are synchronized to a clock; column 30, lines 53-67; column 31, lines 1-60).

Regarding claim 16, Russell et al. disclose the antenna comprises a diversity antenna 520 (Figure 29; column 17, lines 57-62). More specifically, Russell et al. disclose that the antenna elements in the optical base station (Figure 29) includes an additional antenna 520 for providing diversity reception with the main antenna 516 (column 17, lines 57-62). It would also be well understood in the art that main antenna 516 is also a "diversity antenna" (i.e., an antenna which enables diversity reception since it receives part of the signal along with the other antenna 520).

Regarding claim 17, Russell et al. disclose receiving RF signals through the antenna (column 17, lines 53-59).

Regarding claim 18, Russell et al. disclose a signal receiving method for a communications system (Figures 17, 27A, 27B, 28, and 29), comprising:

receiving RF signals through an antenna 516 of a first station (optical node 342 shown in Figure 29; column1 7, lines 53-59);

converting the received RF signals to first digital electronic signals (using analog-to-digital converter 534 and QAM modulator 536; column 17, lines 59-61) ;

converting the first digital electronic signals to digital optical signals (using AM optical transmitter 538; column 17, lines 63-65);

transmitting the digital optical signals over an optical link 340B to an optical connecting unit (element 338 in Figure 28; see also Figure 17);

converting the digital optical signals to second digital electronic signals in the optical coupling unit (using AM optical receiver 466; column 17, lines 36-39), the second digital electronic signals including in phase and quadrature phase (I/Q) signals; and

providing the second digital electronic signals from the optical coupling unit to a second station (such as base station 30 as shown in Figure 17).

Again, Examiner notes that although Russell et al. do not specifically use the term "I/Q signals" in their disclosure, it is well understood in the communications art that quadrature amplitude modulated (QAM) signals *are* digital in phase and quadrature phase signals due to the nature of the modulation which defines QAM signals. Therefore, Russell et al. inherently disclose "digital I/Q signals" because they disclose QAM signals.

Regarding claim 19, Russell et al. disclose that the optical link 340B comprises an optical cable (column 17, lines 62-65).

Regarding claim 21, Russell et al. disclose that the antenna comprises a diversity antenna 520 (column 17, lines 57-62). More specifically, Russell et al. disclose that the antenna elements in the optical base station (Figure 29) includes an additional antenna 520 for providing diversity reception with the main antenna 516 (column 17, lines 57-62). It would also be well understood in the art that main antenna 516 is also a "diversity antenna" (i.e., an antenna which enables diversity reception since it receives part of the signal along with the other antenna 520).

Regarding claim 26, Russell et al. disclose a signal transmitting method in a communication system (Figures 17, 27A, 27B, 28, and 29), comprising:

converting digital I/Q signals to optical signals in an optical connecting unit (using AM optical transmitter 462 in Figure 28);

transferring the optical signals over an optical cable 340A to a remote station (i.e., optical node 342 shown in Figure 29); and

converting the optical signals into RF signals for transmission (using AM optical receiver 500, QAM demodulator 502, digital-to-analog converter 504, mixer 506, etc. in the optical node as shown in Figure 29).

Regarding claim 28, Russell et al. disclose that converting the optical signals comprises:

converting the optical signals into analog signals and demultiplexing the analog signals (using QAM demodulator 502, and digital-to-analog converter 504; column 45-51);

up converting and filtering the demultiplexed analog signals to generate the RF signal (using mixer 506; column 17, lines 48-51); and

amplifying and filtering the RF signals (using amplifier 510 and filter 512; column 17, lines 51-53).

Regarding claim 29, Russell et al. disclose converting the digital I/Q signals comprises multiplexing the digital I/Q signals (using QAM modulator 460 in Figure 28; column 17, lines 31-41) and inputting the multiplexed digital I/Q signals into an optical transceiver (AM optical transmitter 462) to generate the optical signals.

Regarding claim 30, Russell et al. disclose receiving external RF signals through an antenna coupled to the remote station (column 17, lines 53-65);

converting the external RF signals to second optical signals (using mixer 528, analog-to-digital converter 534, QAM modulator and AM optical transmitter 538 in Figure 29);

transferring the second optical signals to the optical connecting unit (through optical fiber 340B); and

converting the second optical signals to second digital I/Q signals (using AM optical receiver 466 and QAM demodulator 464 in Figure 28).

Regarding claim 31, Russell et al. disclose a communication system (Figures 17, 27A, 27B, 28, and 29), comprising:

an optical connecting unit ("Head End" element in Figure 17, including QAM modulator 460 and AM optical transmitter 462 shown in Figure 28), configured to receive first digital I/Q signals and convert the first digital I/Q signals into first digital optical signals (column 17, lines 31-36); and

a remote base station (optical node 342 in Figure 17, shown in detail in Figure 29), coupled to receive the first digital optical signals and configured to convert the first digital optical signal to first analog RF signals for transmission (column 17, lines 42-53).

Regarding claim 32, Russell et al. disclose that base station 342 is further configured to receive second RF analog signals and convert the second analog RF signals to second digital optical signals (using mixer 528, analog-to-digital converter 534, QAM modulator and AM optical transmitter 538 in Figure 29; column 17, lines 53-65); and

that the optical connecting unit is coupled to receive the second digital optical signals and further configured to convert the second digital optical signals to second digital I/Q signals for transmission (using AM optical receiver 466 and QAM demodulator 464 shown in Figure 28; column 36-41).

Regarding claim 33, Russell et al. disclose a communication system, comprising:

an optical connection unit ("Head End" element in Figure 17, including elements shown in Figure 28), configured to convert first digital I/Q signals to first optical signals and to convert second optical signals to second digital I/Q signals (column 17, lines 31-41); and

a remote base station (optical node 342 in Figure 17, shown in detail in Figure 29), coupled to receive the first optical signals, and configured to convert the first optical signals to third digital I/Q signals, convert the third digital I/Q signals to first RF signals, transmit the first RF signals, receive second RF signals, convert the second RF signals to fourth digital I/Q signals, and convert the fourth digital I/Q signals to the second optical signals (column 17, lines 42-65).

Regarding claim 34, Russell et al. disclose an optical link coupling the optical connecting unit to the remote base station (fibers 340A and 340B) .

Regarding claim 35, Russell et al. disclose that the remote base station comprises a diversity antenna 520 (column 17, lines 57-62). More specifically, Russell et al. disclose that the antenna elements in the optical base station (Figure 29) includes an additional antenna 520 for providing diversity reception with the main antenna 516 (column 17, lines 57-62). It would also be well understood in the art that main antenna 516 is also a "diversity antenna" (i.e., an antenna which enables diversity reception since it receives part of the signal along with the other antenna 520).

Regarding claim 36, Russell et al. disclose that the optical connecting unit comprises a multiplexer configured to multiplex the first digital I/Q signals and a demultiplexer configured to demultiplex the second digital I/Q signals (QAM modulator 460 and QAM demodulator 464, respectively, in Figure 28; column 17, lines 31-41), and

that the remote base station comprises a demultiplexer configured to demultiplex the third digital I/Q signals and a multiplexer configured to multiplex the fourth digital I/Q signals (QAM demodulator 502 and QAM modulator 536, respectively, in Figure 29; column 17, lines 42-65).

Regarding claims 37, 38, and 40-42, Russell et al. disclose converting the first digital I/Q signals from parallel to serial (column 8, lines 56-64). Specifically, Russell et al. disclose an embodiment of their system (Figures 2-4) wherein the signals carrying data to be transmitted are processed in a base station (including elements of base station 106, which includes digital transmitter/receiver unit 130 as shown in Figures 3 and 4). This base station is also connected to an optical connecting unit comprising an optical transmitter (laser 136) and optical receiver 140 as shown in Figure 4 which connect the base station to the remote optical base stations (remote units 102 as shown in Figures 2-4). Russell et al. further disclose that the signals to be transmitted from the base station may be parallel and if so, they are converted from parallel to serial before being output from the optical transmitter to the remote units (column 8, lines 56-64).

Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Russell et al. in view of Gordon et al. (US 5,067,173 A).

Regarding claim 3, Russell et al. disclose a system as discussed above with regard to claim 2 and further disclose that the optical base station (optical node 342 as shown in Figure 29) further comprises:

a plurality of filters 518 and 522 configured to remove a noise component of a second RF signal collected by a corresponding plurality of antennas 516 and 520;

a plurality of down-converter units (mixers 528 and 524 and analog-to-digital converter 534) configured to band-pass filter, down-convert and analog to digital convert, the second RF signals.

Russell et al. explicitly show one duplexer 514 but do not specifically disclose a plurality of duplexers. However, Russell et al. also already disclose that the optical base station may include a plurality of antennas for transmitting and receiving a plurality of channels (Figure 42). It would have been obvious to a person of ordinary skill in the art to provide a plurality of duplexers to correspond to a plurality of antennas in the system disclosed by Russell et al. in order to separate the incoming and outgoing signals from each other and ensure that they are properly processed.

Russell et al. also do not specifically disclose a plurality of amplifiers to amplify the second RF signals. However, Gordon et al. teach a system related to the one disclosed by Russell et al. including receiving RF signals at antennas (Figure 2). Gordon et al. further teach a plurality of amplifiers 204 and 212 configured to amplify RF signals outputted from the antennas. It would have been obvious to a person of ordinary skill in the art to include antennas as taught by Gordon et al. in the system disclosed by Russell et al. in order to ensure that the level of received RF signals is high enough for proper reception and processing.

Regarding claims 4 and 5, Russell et al. discloses that the optical base station further comprises a clock unit configured to provide a synchronous signal to the multiplexer/demultiplexer unit and further comprises a reference clock unit configured to provide the synchronous signal of the clock unit to the up-converter unit and the plurality of down-converter units (column 31, lines 10-18).

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Russell et al.

Regarding claim 9, Russell et al. disclose a system as discussed above with regard to claim 1 and further disclose that the optical connecting unit receives the first digital I/Q signal from the base station (including base station element 303 which is shown in detail in Figure 27A). In other words, Russell et al. disclose that the optical connecting unit receives the first digital I/Q signals from at least one transmitter of the base station, but they do not specifically disclose at least one channel card. However, channel cards are well known in the art as a widely available hardware implementation of the signal transmitting elements already disclosed by Russell et al. in the base station (Figure 27A shows transmitters 453). It would have been obvious to a person of ordinary skill in the art to specifically use transmitters implemented in channel cards in the base station disclosed by Russell et al. as an engineering design choice of a way to provide the transmitters using available and readily replaceable transmitter hardware.

(10) Response to Argument

Regarding all claims, and regarding Appellant's arguments with respect to claims 1, 2, 10, 11, 12, 18, 26, 28, 31, 32, 33, and 34 in particular, Examiner disagrees with Appellant's assertion that Russell et al. do not disclose the "base station," "optical connecting unit," "optical base station," or "remote base station" as recited in the claims.

Regarding Appellant's arguments that Russell et al. do not disclose the recited "base station configured to output first digital in phase and quadrature phase (I/Q) signals," Examiner respectfully notes that Russell et al. do disclose a subsystem which performs the recited function of being configured to output first digital I/Q signals. This subsystem comprises three parts as illustrated in Figure 17 of Russell et al.: 1) the element labeled by Russell et al. as base station

330; 2) head end unit 332; and 3) the QAM modulator 460 within 338 AM modulator/demodulator as shown in detail in Figure 28.

Importantly, Russell et al. themselves explicitly disclose that the element "base station 330" may be co-located with the head end unit 332, without being separated by lines 331A and 331B as illustrated in Figure 17. Specifically, Russell et al. state that "base station 330 could be located at the head end, with the elimination of the fiber link and other unnecessary components, such that the RF signal output of the transmitters may be filtered and applied directly to the AM modulator/demodulators 338 and in return the output of the AM modulator/demodulators 338 filtered and applied directly to the receivers 28" (column 15, lines 35-42).

Examiner's position is that Russell et al. disclose the claimed "base station configured to output first digital in phase and quadrature phase (I/Q) signals" despite using their own terminology in their disclosure and despite illustrating the elements of their system in a way that organizes those elements in a manner which is different from Appellant. Examiner respectfully asserts that one could elect to draw a box around the three parts named above in the disclosure of Russell et al. and thereby define a base station that meets the limitations of Appellant's claim 1.

Regarding Appellant's arguments that Russell et al. do not disclose the recited optical base station or remote base station, Examiner maintains that the optical node 342 shown in Figures 17 and 29 of Russell et al. performs all the recited features of the so-called "optical base station" or "remote base station" recited in the claims, including receiving the optical signal through the optical cable 340A, converting the optical signals into second digital I/Q signals (using AM optical receiver 500 in Figure 29; column 17, lines 43-45), and converting the second digital I/Q signals into first RF signals for transmission (using QAM demodulator 502 and

digital-to-analog converter 504 in Figure 29; column 17, lines 45-53). Again, Examiner maintains that Russell et al. disclose the claimed "optical base station" or "remote base station" despite using their own terminology and calling this element an optical "node." Examiner also notes that optical node 342 disclosed by Russell et al. is a remotely located communication station (i.e., located away from the other elements of the network by a geographically significant distance).

Examiner respectfully notes that the terms "base station," "optical base station," and "remote base station" are not terms with specific, singular meanings in the communications art such that they would inherently confer additional limitations to Appellant's claim beyond those actually recited. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding claims 3-5 in particular, Examiner disagrees with Appellant's assertion on page 13 of the brief that "there is no suggestion in Russell...to provide a plurality of duplexers." Russell et al. show one duplexer 514 in the optical base station shown in Figure 29 but do not specifically disclose a plurality of duplexers. However, Russell et al. do explicitly disclose that the optical base station may include a plurality of antennas for transmitting and receiving a plurality of channels (Figure 42). It would have been obvious to a person of ordinary skill in the art to provide a plurality of duplexers to correspond to this disclosed plurality of antennas in the system disclosed by Russell et al. in order to separate the incoming and outgoing signals from each other and ensure that they are properly processed when a plurality of antennas are used to extend the range of communications. In other words, Russell et al. suggest a motivation for

including a plurality of duplexers from the disclosure of the use of a duplexer in general in Figure 29 and from the disclosure of including a plurality of antennas as shown in Figure 42.

Examiner also respectfully notes that Russell et al. disclose a clock signal as recited in the claims because they disclose that "the down-conversion and up-conversion are implemented by mixing the signal with a local oscillator (LO)" (column 30, lines 61-62), wherein the LO frequency is established by reference clock signals (column 31, lines 3-9).

Regarding claims 6, 16, 21, and 35 in particular, Examiner disagrees with Appellant's argument that Russell et al. do not disclose the limitations recited in the claims. It is well understood in the communications art that "diversity" reception generally refers to the receiving of a same signal using more than one receiving antenna in order to more effectively receive the signal. Examiner notes that both Appellant's specification (see page 16, paragraph 52) and the disclosure of Russell et al. (see column 17, lines 57-62) use the term "diversity" in this way. Although Appellant refers to both antennas 116 and 118 in their Figure 6 as "diversity antennas," the antennas 516 and 520 disclosed by Russell et al. in Figure 29 are also both "diversity" antennas in the sense that they are jointly used for diversity reception. In other words, Russell et al. label antenna 516 as a "main antenna" and label the extra antenna 520 as a "diversity antenna," but it would be well recognized in the communications art that Russell et al. disclose diversity reception using both antennas. Therefore, it would also be well understood in the art that main antenna 516 is also a "diversity antenna" (i.e., an antenna which enables diversity reception since it receives part of the signal along with the other antenna 520).

Regarding claim 7 in particular, Examiner disagrees with Appellant's argument that Russell et al. do not disclose the limitations recited in the claims. Examiner respectfully notes

that Russell et al. disclose a "base station" as discussed above with regard to independent claim 1. Russell et al. also disclose a clock signal as recited in the claims because they disclose that "the down-conversion and up-conversion are implemented by mixing the signal with a local oscillator (LO)" (column 30, lines 61-62), wherein the LO frequency is established by reference clock signals (column 31, lines 3-9).

Regarding claim 9 in particular, Examiner disagrees with Appellant's argument that Russell et al. do not disclose or suggest the limitations recited in the claims. Examiner notes that Appellant argues that "Russell has no suggestion for receiving digital I/Q signals from a channel card" and does not specifically argue that the transmitters disclosed by Russell et al. may not be implemented as channel cards. Examiner maintains that Russell et al. disclose that the optical connecting unit receives the first digital I/Q signals which are transmitted from the base station as discussed above with regard to independent claim 1, wherein the "base station" includes base station element 303 having transmitters 453 (element 303 is shown in detail in Figure 27A). Therefore, Russell et al. disclose that the optical connecting unit receives the first digital I/Q signals from at least one transmitter of the base station.

Channel cards are well known in the art as a widely available hardware implementation of the signal transmitting elements disclosed by Russell et al.. Note that the term "channel card" generally refers to an element which transmits/provides a signal (channel) which is implemented on some form of circuit board or card. It would already be well understood in the art that the transmitters disclosed by Russell et al. already inherently includes some circuitry connected and mounted in some way. It would have been obvious to a person of ordinary skill in the art to specifically use transmitters implemented in channel cards in the base station disclosed by

Russell et al. as an engineering design choice of a way to provide the transmitters using available and readily replaceable transmitter hardware.

Regarding claim 17 in particular, Examiner disagrees with Appellant's general assertion on pages 23 and 24 of the brief that "the applied references do not teach or suggest" the features of claim 17. On the contrary, Russell et al. explicitly disclose receiving RF signals through the antennas 516 and 520 (column 17, lines 53-59). Examiner also maintains that Russell et al. disclose that the antenna is in an optical base station as discussed above with regard to independent claim 11.

Regarding claim 19 in particular, Examiner disagrees with Appellant's general assertion on pages 25 and 26 of the brief that "the applied references do not teach or suggest" the features of claim 19. On the contrary, Russell et al. explicitly disclose that the optical link 340B comprises an optical cable (column 17, lines 62-65). Examiner also maintains that Russell et al. disclose that the antenna is in an optical base station as discussed above with regard to independent claim 18.

Regarding claim 30 in particular, Examiner disagrees with Appellant's general assertion on page 29 of the brief that "the applied references do not teach or suggest" the features of claim 30. On the contrary, Russell et al. explicitly disclose receiving external RF signals through an antenna coupled to the remote station (column 17, lines 53-65);

converting the external RF signals to second optical signals (using mixer 528, analog-to-digital converter 534, QAM modulator and AM optical transmitter 538 in Figure 29);

transferring the second optical signals to the optical connecting unit (through optical fiber 340B); and

converting the second optical signals to second digital I/Q signals (using AM optical receiver 466 and QAM demodulator 464 in Figure 28).

Examiner also maintains that Russell et al. disclose that the antenna is in a remote station as discussed above with regard to independent claim 26

Regarding claim 8 in particular, Examiner disagrees with Appellant's argument that Russell et al. do not disclose the limitations recited in the claims. Examiner respectfully notes that Russell et al. disclose that AM optical receiver 466 receives signals optical signals from an "optical base station" comprising optical node 342 as discussed with regard to claim 1. Russell et al. also disclose converting received optical signals into digital I/Q signals as discussed in Russell et al., column 17, lines 36-41.

Regarding claims 14 and 29 in particular, Examiner disagrees with Appellant's argument that Russell et al. do not disclose the limitations recited in the claims. Examiner maintains that Russell et al. disclose a "base station" that outputs digital I/Q signals as discussed above with regard to independent claims 11 and 26. Russell et al. further disclose converting the digital I/Q signals by multiplexing the digital I/Q signals (using QAM modulator 460 in Figure 28; column 17, lines 31-41), and they also disclose inputting the multiplexed digital I/Q signals into an optical transceiver (AM optical transmitter 462) to generate the optical signals.

Regarding claims 13 and 15, Examiner disagrees with Appellant's argument that Russell et al. do not disclose the limitations recited in the claims. Russell et al. disclose that demultiplexing and multiplexing is performed in accordance with a synchronous signal (column 31, lines 43-60). More specifically, Russell et al. disclose alternative embodiments of their communications network such as shown in Figure 42 including a plurality of base station units

906 which are optically connected to a plurality of remote optical base stations 902 over fiber links 905 (column 28, lines 50-67; column 29, lines 1-23), wherein demultiplexing and multiplexing of signals is performed in accordance with a synchronous signal (i.e., they are synchronized to a clock; column 30, lines 53-67; column 31, lines 1-60).

Regarding claims 37, 38, and 40-42 in particular, Examiner disagrees with Appellant's argument that Russell et al. do not disclose the limitations recited in the claims. Russell et al. disclose converting the first digital I/Q signals from parallel to serial (column 8, lines 56-64). Specifically, Russell et al. disclose an embodiment of their system (Figures 2-4) wherein the signals carrying data to be transmitted are processed in a base station (including elements of base station 106, which includes digital transmitter/receiver unit 130 as shown in Figures 3 and 4). This base station is also connected to an optical connecting unit comprising an optical transmitter (laser 136) and optical receiver 140 as shown in Figure 4 which connect the base station to the remote optical base stations (remote units 102 as shown in Figures 2-4). Russell et al. further disclose that the signals to be transmitted from the base station may be parallel and if so, they are converted from parallel to serial before being output from the optical transmitter to the remote units (column 8, lines 56-64).

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Christina Leung

Conferees:

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